only the following items whose numbers correspond to locations on fig. 3:

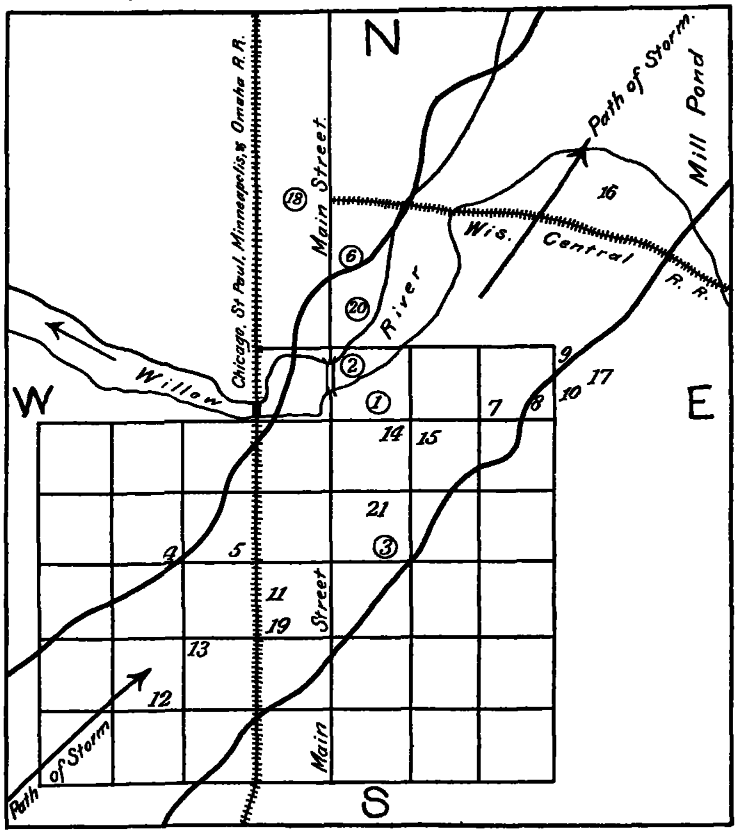

Fig. 3.—Path of destruction through the City of New Richmond, Wis.

1. Here an iron bar 4 feet long, 4 inches wide, and ½ inch thick, was driven into a lombardy poplar and solidly embedded at about 3 feet above the ground. The bar pointed toward the northwest and was said to have come from a blacksmith's shop in that direction, on the other side of the Willow River.

3. Dr. Epley's house and office; the eastern end of the office was blown away, but the house was standing and in a fair state of preservation; this is one of the marks of the work of the eastern cone.

4. Dr. Krapps' house and office; the house was turned from the west around to the south on its foundations.

5. A complete circle of boards driven deep into the earth, the circle was 90 feet in diameter and was best marked in the northwest quadrant. Furrows showed where other boards had struck the earth and were carried on. At the same place was found the body of a boy who had been carried from Hawkins' house, No. 19.

6. A sill beam 20 feet by 10 inches, from a destroyed planing mill, 2 rods to the southeast is here thrust into the ground, so that only 5 feet protruded, pointing toward the southeast.

7 and 8. Buildings standing but the roofs gone.

13. Judge Hough's house a wreck, but walls still standing. To the west and southwest of this there was complete destruction.

14. A dwelling house, some of whose contents were carried southward.

15. The power house, whose beams were carried northward, and the library whose books were carried northward.

16. Glover's lumber yards practically untouched.

18. The point from which Emil Gerde saw the tornado cloud approaching.

The loss of life was very large in the cellars where people fled for shelter. The wind was so fierce that everything was swept clean, then the débris from other buildings poured into the cellars with fatal results.

THE USE OF THE STORAGE BATTERY FOR THE ELECTRICAL RECORDING INSTRUMENTS.

By Elisha C. Vose, Observer Weather Bureau (dated July 17, 1899).

The use of the storage battery, now in successful operation at the Chicago station, for the purpose of furnishing the electric current for the self-registering instruments, had been under consideration by Professor Cox for some time.

It was at first thought that the current might be taken directly from the electric light wires or the main wire, and reduced from a voltage of 110 to 4 or 6 volts by rheostat. Experiments were made along this line, the tele-thermograph being connected, but it was found that heat was being generated in the magnets; the current was at once shut off and the cause sought for, which was found to be a ground. The only way that this could be eliminated was by running a separate wire directly from the dynamo, which should not be used for other purposes. The old main feed wire which was put in to furnish the current for the experiments with the search light of the ill-fated battleship *Maine*[1] was used for this purpose. Professor Moore, while in charge of this office, had placed this light on the top of the Auditorium Tower for testing flash lights as a means of giving notice of the approach of cold waves and other warnings. But it was not practical to run a separate wire on account of the cost, and then there were other reasons why the direct current would not be feasible, even on the direct main feed wire: 1. If at any time it should be necessary to shut down the dynamo for repairs, or otherwise, the power for all the instruments would be affected, and the record would be lost for a longer or shorter period. 2. If in any way the main wire should become grounded with the building or with other wires, as was very liable to happen, it might cause the very delicate magnets to be burned out, thus destroying the effectiveness of the instruments. 3. The direct current has too high a potential, even if greatly reduced by the rheostat, to be adapted to furnish the current for such delicate mechanism as these meteorological instruments contain. For these reasons it was apparently necessary to abandon further experiments with the direct current.

Attention was then turned to the storage battery as furnishing a steady current of high intensity and low potential, such as would be especially adapted for furnishing the electromotive force for delicate instruments.

The Auditorium Association, through Mr. A. W. Sawyer, the secretary, very kindly consented to furnish the storage battery in order to give this important forecast center and station an up-to-date electrical equipment, if after a test of thirty days, it was found to do the work in a satisfactory manner.

Eight cells were purchased and these were divided into four batteries of two cells each; two of these batteries are always charging, while the other two are furnishing the current. Each of these batteries has an electro-motive force of 4 volts and a current of 12 amperes, and will run for forty hours. The current is taken directly from the electric light wires, and each battery is charged for twenty-four hours through one 8-candle power light of 110 volts, thus giving a low potential; this is also for the purpose of inserting resistance in the circuit with the storage cells from such a high voltage circuit. In order to provide against a short circuit in the electric light wires, another connection was prepared with the main wire, so that this could be used at any time in case of emergency. The batteries are connected with what is termed a "four-point switch," so that when the switch is thrown, one battery is "set in" while the other is "set out," that is, one battery furnishes the current while the other is charging. In order that there may be as little confusion as possible about the time of changing the batteries, the observer who changes the sheet at noon each day throws the switch at the same time, so that he is as little likely to forget to change the battery as to neglect to change the sheet. It will be noticed that the cells are 40 ampere-hour cells, and that they are in operation only twenty-four hours. Thus, it is so provided that in case the observer should fail to attend to the batteries at noon each day, still there would be no loss of the records on that account, as the batteries would easily furnish

[1] Monthly Weather Review, Vol. XXVI, p. 58.

sufficient current for running the instruments until nearly the expiration of the 40-hour limit, or at least until the next morning. The wind direction and velocity and the telethermograph are run from one battery of two cells, and the sunshine and rain gage could also be connected with the same battery if the circuits on the new triple register were properly arranged, as this battery has sufficient electro-motive force for running all the instruments. It might be asked in case of a continued high velocity for twenty-four hours, or more, if the force of the battery would not be so exhausted as to cease to do the work. The answer would be that the electromotive force is constant almost to the 40-hour limit, and that there is no danger of the battery not having ample force to do the work. The internal resistance is remarkably low and the construction enables the cell to be charged at a minimum electro-motive force, and to be discharged at a maximum.

The elements of the American storage cells consist of two plates made from solid sheets of pure rolled lead, grooved on both sides, separated by a rubber separator, and bound together with large rubber bands, and the "active material" is formed from the lead itself by an electro-chemical process, and is strongly adherent. The fluid consists of a mixture of one part by volume of sulphuric acid to five parts of water. As now arranged the second battery runs the sunshine recorder and rain gage, and it is also intended to put all the electric bells in the office on this battery.

The batteries have now (July 17) been in operation since May 28, and they are doing good work. The life of the battery for our light work is thought to be from five to ten years before the elements have to be renewed, and at the present price the cost for renewing the elements would be about one-half the original cost. The original cost was about $45 for the entire equipment.

IRRIGATION BY WIRE.[1]

By ARTHUR BETTS, Voluntary Observer, Weather Bureau, Ridgeway, Iowa.

(1) *June* 12, 1899.—My idea is to collect moisture from the air. Wire will do the work; it will take the moisture, which will roll down in drops, to the ground. We want poles about ten feet high. Only a few are required to the acre, and five acres in the square form would not take more than 50 poles. Put on the wire and make a complete network of wire overhead, joining from every direction, and in those countries where mountain or river irrigation is impossible man will be his own rainmaker. The wire might be painted green or blue, those being cool colors and capable of condensing more moisture. This would be a cheap means of irrigation. The idea first occurred to me a year ago.

(2) *July* 14, 1899.—Some time ago I wrote to you about collecting moisture through the medium of wires and received a reply stating that you wanted me to make some successful experiments. * * * I have the affair in running order and will report to you when I can have sufficient data. I have already made one successful experiment; but, as in the heat of summer fog and mist seem to come at long intervals apart, it may be several months yet before I can report to you on the results of my experiments. We are having much rain, followed by warm sunshine, but not much fog.

[1] Some months ago Mr. Betts informed the Chief of the Weather Bureau that he was confident that the important problem of the utilization of fog in arid regions could be best accomplished by using wire or wire screens as the obstacle to catch the fog and conduct it as drip to the roots of the plants. The Editor requested him to make actual experiments and measurements. The following three communications from him give the story of his first work and its results. Of course similar experiments in other regions are very much to be desired.—ED.

(3) *August* 22, 1899.—The following table shows what can be done with wire as a means of irrigation. The poles, four in number, are 7 feet high and cover 7 by 7 feet, equal 49 square feet, of surface, and the wire is netted in 6-inch squares. The following shows the result in fog, mist, and dew:

The wires were common fence wire. As wood absorbs too much moisture, I used a tin basin 9 inches across and 3 inches deep [to catch and measure the drip.—ED.]. It was round and the sides very nearly perpendicular. During the forty days the Government rain gage collected 3.44 inches precipitation, of which 0.13 inch was fog, mist, and dew, and this 0.13 inch was twelve times that amount by wire [? $\frac{1}{12}$ of the amount—ED.], and the wire was not painted, either. It was quite a sight to see the wire dripping with ten thousand drops in the early morning. My observations show that even dew can be utilized for irrigation purposes. My rule is to place the wire network in squares whose sides are as the square of the altitude, e. g.: At an altitude of 1 meter, 9 square inches; 2 meters, 36 square inches; 3 meters, 81 square inches; 4 meters, 144 square inches; 5 meters, 225 square inches; 6 meters, 324 square inches; 7 meters, 441 square inches; 8 meters, 576 square inches. Thus, the higher the poles the less the amount of wire needed.

As the 6-inch square appears like a speck from a distance, so a speck on the ground beneath would receive all the drops of water from that far off square. My experiments are accurate even to 0.01 inch, and now, having been very successful in this work, I give it to the world, trusting that it will prove a blessing to many.

Observations of drip at Ridgeway, Iowa.

Date and month.	Kind of precipitation.			Duration.		Precipitation.		Remarks.
	Fog.	Mist.	Dew.	Fog or mist.	Dew.	In gage.	By wire.	
1899.				*H'rs.*	*H'rs.*	*Inch.*	*Inch.*	
July 14	fog.	mist.	......	12	......	0.02	0.20	Mist heavy.
15	fog.	......	......	12	......	T.	0.07	Fog unsteady.
17	.....	......	dew.	......	10	T.	0.03	Dew heavy.
18	......	....	dew.	......	10	0.00	0.01	Dew copious.
19	......	......	dew.	......	9	T.	0.03	Dew heavy.
20	......	......	dew.	......	9	0.00	0.01	Dew copious.
21	fog.	......	dew.	2	8	0.00	0.02	Fog very light.
22	fog.	......	dew.	4	10	T.	0.05	Fog light; dew heavy.
23	fog.	......	dew.	3	10	T.	0.04	Fog light; dew heavy.
29	fog.	mist.	dew.	5	10	0.01	0.10	Fog unsteady.
Aug. 2	......	.....	dew.	.. ..	10	T.	0.05	Dew very heavy.
3	fog.	mist.	......	5	0	0.04	0.35	Mist and fog heavy.
5	......	......	dew.	......	10	T.	0.03	Dew heavy.
16	......	......	dew.	......	10	0.00	0.02	Dew copious.
18	.....	......	dew.	......	10	0.00	0.02	Dew copious.
19	.....	......	dew.	......	10	T.	0.04	Dew very heavy.
20	fog.	mist.	......	7	......	0.04	0.34	Mist heavy.
21	......	......	dew.	......	12	0.01	0.09	Dew excessive.
22	......	......	dew.	......	11	0.01	0.08	Dew excessive.
Sums	8	4	15	50	149	0.13	1.58	

The last line shows the sums for the nineteen dates on which there was fog, mist, or dew (on the remaining twenty-one dates, out of the total, forty, there appears to have been nothing to measure.)

We quite sympathize with the enthusiasm shown by Mr. Betts in his communications on this page, and have no doubt that his experiments will lead to others of equal or greater value. We can easily understand that every wire, or every piece of woven wire fence stretched in the free air will catch fog and dew and lead it to the ground, but we do not understand why the wire should lie horizontally instead of hanging vertically, nor do we understand the argument that requires all the drops of water from a small 6-inch square of wire near the ground and those from a 24-inch square four times farther from the ground to fall upon the same "speck beneath." It is more natural to suppose that the drip from a